Transatlantic liners, who are accustomed to make allowance for it when shaping their course to sight the Fastnet. This current is well shown on the author's temperature charts for several months.

In dealing with the question of causation, the author summarises as follows: "The general circulation of the North Atlantic is therefore the result of a large number of factors, each of which is subject to wide variation. From a consideration of the mean results in its relation to the mean atmospheric circulation, it appears that the oceanic circulation is directly controlled by the winds, the form, position and intensity of the whole Atlantic anticyclone and of the cyclonic area to the north of it being taken into account. The movements of water set up directly by these systems are modified by, firstly and chiefly, the configuration of the land, and, secondly, by the effects of melting ice." And again: "The key to the position seems to be the Atlantic anticyclone which controls the low-pressure areas, both directly and indirectly, by its far-reaching effect on the oceanic circulation; and it seems scarcely likely that the causes modifying this system are confined to the Atlantic, even if they are to be found at the surface at all."

It would be regrettable if this work, so ably and successfully inaugurated, should be dropped.

Mr. Dickson mentions that it can be efficiently carried on for the sum of 300*l.* annually, and we are of opinion that the cost might be even less, for on board of almost all large liners the temperature of the sea surface is recorded at intervals of four hours with regularity, and on many, observations for specific gravity also; the rough method by which the latter is obtained is, we admit, unsatisfactory, as the hydrometer is difficult to read when subject to the least movement, but these records are better than none. In the interests of navigation alone this investigation should be continued.

It is noteworthy that, at the present time, there are many navigators who, in some measure, utilise observations of sea-surface temperature, and the time is not, we hope, far distant when the sea-surface thermometer and hydrometer may be recognised generally, as aids in determining to some extent changes in the direction and strength of ocean currents, and as affording the seaman an additional safeguard against miscalculation when approaching land in thick weather.

## *UNIVERSITY AND EDUCATIONAL INTELLIGENCE.*

OXFORD.—Natural science scholarships are announced for competition at Balliol, Christchurch and Trinity on December 3. at Magdalen on December 10, at Jesus on January 14.

Dr. J. S. Haldane, lecturer in physiology, has been elected to a fellowship at New College.

Dr. G. C. Bourne has been re-appointed lecturer in comparative anatomy for a period of three years.

Mr. O. J. R. Howarth, of Christ Church, has been elected to the geographical scholarship.

The celebration of the tercentenary of Bodley's Library will take place in October, 1902, and a delegacy of twelve will shortly be appointed to undertake the necessary arrangements.

The 227th meeting of the Oxford University Junior Scientific Club was held (Wednesday, October 23) at the Museum. The principal business of the evening was a paper by H. S. Souttar, of Queen's College, entitled "The Atom, an Electromagnetic Theory of Matter." The principal officers of the Club for this term are:—president, A. C. le Rossignol, Exeter; treasurer, E. L. Kennaway, New College; chemical secretary, E. Walls, Corpus; biological secretary, E. Burstal, Trinity; Boyle Lecture treasurer, S. A. Ionides, Balliol; editor, H. D. Davis, Balliol; members of committee, J. G. Priestley, Christ Church; Rev. G. D. Allen, non-collegiate.

CAMBRIDGE:—Mr. H. Lamb, Trinity, Mr. J. Larmor, St. John's, Mr. H. W. Richmond, King's, and Mr. E. T. Whittaker, Trinity, have been appointed examiners for the Mathematical Tripos, part 2, to be held in 1902.

Mr. W. T. N. Spivey, of Trinity College, died on October 22 from septic pneumonia following a lamentable accident which happened to him in the University Chemical Laboratory a fortnight before. Mr. Spivey was engaged in research work and was shaking two volatile and explosive liquids in a flask when an explosion occurred and he was seriously cut and burned. The sad death of this promising young chemist is much regretted.

DR. R. THAXTER has been appointed professor of cryptogamic botany at Harvard University.

AT a meeting of the Royal University of Ireland held on Friday last, the degree of D.Sc. was conferred upon Prof. W. N. Hartley, F.R.S.

A NEW Hall of Natural History is to be erected in connection with Syracuse University at the expense of an anonymous donor.

MR. F. E. REES, lecturer in physics at the Storey Institute, Lancaster, has been appointed to the lectureship and demonstratorship of physics at the University College of North Wales, Bangor.

*Science* states that Milliken University, Decatur, Ill., will be opened next year with an endowment of more than a million dollars, half of which sum has been given by Mr. James Milliken. Prof. S. R. Taylor, late of the Kansas State Normal School, has been appointed the president.

ADDITIONAL examiners in mathematics, chemistry, zoology, materia medica and therapeutics, medicine and clinical medicine, surgery and clinical surgery will shortly be appointed by the University of Glasgow. Applications for the appointments must be lodged on or before December 3 next.

A CIRCULAR just issued by the Board of Education describes the principles which are being followed with regard to making grants to schools and classes conducted by School Boards under the provisions of the new Education Act. When the local Authority has given a general sanction to the work of an existing school, the school is eligible for grants upon subjects taught in the twelve months preceding the passing of the Act. Extensions of the curriculum, or of the work of a school by including pupils of an age or sex not previously admitted, will not be recognised unless the specific sanction of the Local Authority has been furnished to the Board of Education.

ACCORDING to *Science*, the attendance at Cornell University, including 850 new students, is about 250 in excess of that of last year. Inclusive of the medical school in New York and the summer school at Ithaca, the total registration for the year is between 3250 and 3500. The registration on the campus, of students in regular courses, promises to be about 2750. Sibley College has a total attendance of new students, in all classes and courses, of above 350, almost equal to the total of upper classmen returning to the college, making the probable total registration for 1901–2 about 750 in all grades. The College of Civil Engineering has inceased fifty per cent., and the other colleges and departments report large additions.

THE Hon. T. Jefferson Coolidge, of Boston, has given more than 50,000 dollars to the Jefferson Physical Laboratory of Harvard University to further physical research. In the terms of the gift he states that:—"The income of this fund shall be used primarily for laboratory expenses of original investigations by members of the laboratory staff. But the Director, at his discretion, may award therefrom an honorarium, of not more than five hundred dollars per annum, for the private use of any person who—although receiving no salary from the University—may wish to carry on original investigations under his directions at the Jefferson Laboratory. The results of such investigations shall appertain to the Laboratory, and the name of the Laboratory shall accompany the investigation; but no publication shall be made without the approval of the Director. The balance of this income is to be used only for meeting the legitimate expenditures of original investigations whether by professors or students."

IN introducing Mr. James Stuart, the Lord Rector of St. Andrews University, to the gathering held at Dundee on Friday, October 25, Lord Balfour of Burleigh, the newly-elected Chancellor of the University, remarked that it was said that trade was being taken away from the country, that German chemistry had deprived Britain of the indigo trade, that we had to go to other countries for our goods, and that, generally speaking, trade in this country was in a bad way. The British manufacturer depended upon old methods, while the German employed newer. It was their business to help the manufacturers of this country to put an end to this. What was wanted in Dundee was a greater

subdivision of subjects. They wanted a chair of geology and much more subdivision in the different branches of chemistry, and, first and foremost, a chair of the German language and literature. More teaching power was required and more space in which that power might exercise itself.

THE installation of Lord Balfour of Burleigh as Chancellor of the University of St. Andrews, in succession to the late Duke of Argyll, was made the occasion of a series of brilliant functions in the ancient city last week. The address delivered by Lord Balfour after his installation dealt with several important aspects of higher education, and his statement of the relationship between national progress and scientific research should be of value in showing that the work done in a progressive University is technical training of the highest kind. Referring to University studies, Lord Balfour remarked, "Besides the broad general treatment of any scientific course, the University should be enabled, as a sequel to that course, to specialise in the more advanced stages of scientific training and to encourage original research on particular lines. For this purpose the University must have full equipment and must be furnished with teachers of special attainments, who will direct and guide that original research. The students will pursue the subject as a University study, and with the view of enlarging and advancing the knowledge of their special subject. In this way only can a real advance in scientific knowledge be made; and from the students who pursue these courses—generally, I would say, post-graduate courses—we must look for the enlargement of scientific knowledge, and amongst them or as the products of their efforts we may find pioneers in the application of truly scientific method to our manufactures. A modern University must deal with the principles which lie at the root of our commercial relations, and upon which the development of manufactures must rest, just as much as it does with the principles of philology and mental philosophy. Our commercial, no less than our educational position, must be supported by a thorough training, by careful attention to principles and by imparting to young men who are to pursue commercial pursuits the power of grasping the wider aspects of the questions with which they will have to deal, and by taking care that while they obtain a training fitted to be of practical value to them in their after life, that training shall be such as will really awaken their intelligence and enable them to cultivate the inestimable qualities of judgment, of foresight and of enterprise." Upon this subject scientific and practical men are in agreement, and the demand will be met, as Lord Balfour remarked, not by curtailing the work of the Universities, or by lowering in any way their standard of scholarship or of pure science, but by enlarging their borders and extending their influence.

## SOCIETIES AND ACADEMIES.

### LONDON.

**Physical Society**, October 25.—Prof. S. P. Thompson, president, in the chair.—A paper on the variation with temperature of the thermoelectromotive force and of the electric resistance of nickel, iron and copper between the temperatures of − 200° and + 1050° was read by Mr. E. P. Harrison. In this paper the changes with temperature of the thermoelectromotive force and the resistance of nickel and iron are traced over a wide range and the singularities present in the curves representing these changes are investigated. In all experiments the same specimens of metal were used. Previous work on this subject has been performed by Tait, Fleming and Dewar, Holborn and Day, and Stansfield. In the author's experiments on E.M.F. an ordinary potentiometer method was used, the potential difference due to the thermocouple being balanced against a portion of that due to two accumulators. Before each reading a standard cadmium cell was balanced on a definite resistance in the accumulator circuit. Readings of E.M.F. of copper-nickel couples were accurate to 1·8 microvolts, while those of copper-iron couples were accurate to less than one microvolt at moderate temperatures. The heating arrangement was designed to give a uniform temperature which was measured by a platinum thermometer and recorded automatically by Callendar's recorder. The cold junctions were placed in a large test-tube full of water, the test-tube being placed in a larger vessel also containing water. The temperature of the cold junctions varied with that of the room, and all observations were reduced to cold junction 0° C. Finally, in each case, observations were taken by placing the junctions in liquid air with the platinum thermometer beside them. To prevent oxidation of the metals forming the junctions at temperatures above 500° it was necessary to exhaust the porcelain tubes which contained them. The curves for variation of E.M.F. with temperature of copper-nickel and copper-iron couples are roughly a straight line and a parabola respectively. The differences between the actual curves and a selected straight line in the former case and a parabola in the latter case have been plotted against temperature. These difference curves show that the maximum variations occur, in the case of copper-iron, at 70°, 230°, and 370°. The temperature of inversion (cold junction 0° C.) is 536° C. and the neutral point is 262° C. In the case of copper-nickel, maximum variations occur at 70° and 340°, and there appears to be a small hysteresis effect at the latter point. The temperature of inversion does not occur within the limits of the experiments, and there is no neutral point. The E.M.F. curve for a nickel-iron couple up to 700° has been obtained from the two previous experimental curves by addition. Above this temperature direct observations have been taken. This curve is nearly linear up to 900°, at which point a decrease in E.M.F. occurs. Curves of thermoelectric power have been derived from the E.M.F. curves by drawing tangents, and these show that a considerable range of the copper-iron curve can be represented by straight lines, but that the remainder is approximately parabolic. The copper-nickel power curve can be represented by bits of straight lines. The Peltier-coefficient variation curve for iron-copper is at first parabolic and can then be made up of straight lines; for copper-nickel it can be made up of bits of parabolas. Considerable difficulty was experienced at high temperatures in getting concordant results owing to chemical changes and other effects. The experiments were therefore carried out under different conditions, and the results are discussed in the paper. In the resistance experiments a potentiometer method was employed, a manganin resistance coil immersed in an oil bath being used as a standard. The resistance of nickel increases with temperature almost parabolically up to 370°, when a change of slope occurs, and the resistance increases much less rapidly and almost linearly up to 1050°. In the case of iron, the resistance curve does not change its parabolic form till nearly 800°, when it becomes linear and remains so up to 1050°. The author concludes from his paper that the thermoelectric change in nickel-copper coincides approximately with the resistance change, but that no thermoelectric peculiarity exists for iron-copper at the temperature of the iron resistance change. Mr. A. Campbell said that with purer iron the change in thermoelectric properties might correspond with the change in resistance. Dr. Knott had performed experiments on nickel in 1886 and got results similar to those of the author. His results with thick wires were different to those with thin, probably because he did not exclude air and prevent oxidation. Mr. Campbell said that he had himself made experiments upon two samples of nickel differing in resistivity, and although their temperature coefficients were also different, the change in slope of the curve connecting resistance and temperature occurred at practically the same temperature in both specimens. Their thermoelectric powers were identical up to 300°, but above they differed slightly. Dr. D. K. Morris pointed out that the thermoelectric force, the resistance and the magnetic properties should be observed at the same time. In taking a thermoelectromotive force there must be a temperature gradient, and in the interesting parts of the curves differences of magnetic properties may arise and produce discrepancies. He drew attention to the caution which must be exercised in differentiating by drawing tangents except when the curves are smooth. Dr. Morris said the connection between resistance and magnetic qualities was interesting. The temperature coefficient of resistance of a magnetic body rises with temperature so long as the body is magnetic, but reverses when the body becomes non-magnetic. He asked for information on the subject. Prof. H. L. Callendar said he had followed the research with interest, and referred to the experimental difficulties, especially at high temperatures. He should like to have said something in reply to Dr. Morris, but he was afraid the subject was a large one and might well be discussed at some future meeting. There were several points to clear up, and the fact that the curves described cannot be represented by straight lines or parabolas showed that the subject was beyond the range of a simple theory. The chairman suggested that it might be well to re-examine more carefully